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DOUBLE-BARRELLED BODY FOR A PERSONAL FIREARM

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DOUBLE BARRELLED BODY FOR A PERSONAL FIREARM

TECHNICAL FIELD OF THE INVENTION

The present invention is related to an ergonomic body for a personal firearm organized with three aligned handles under the main stock encompassing one or several barrels with various bore and a telescopic bayonet, said handles advantageously assuring the functions of butt/housing for two magazines, combined cocking lever and steerable gun bipod for the most advantageous weight balance.

This body widely integrates electronic manoeuvring and data transmission (fire, chambered cartridge, magazine presence, remaining cartridges...) means whose integration leads to a 40 % reduction of classical mechanisms such as striking, rod-pushing and other mechanical coupling with matching weight and room savings.

The resulting production cost reduction from this manufacturing penalizing parts pave the way to a new arms generation particularly attractive in terms of answer to the market needs.

As a matter of fact, these weight and room savings constitute a determining factor for the future fire control systems (infra-red, optronics...) integration henceforth pertaining to the future warrior armament.

It is therefore primordial to reduce the weight and volume of firing weapons systems in order to devote these savings to sophisticated systems for smart ammunitions, the whole remaining in a bulky and voluminal architecture compatible with operational requirements.

In this scope, the present body substitutes advantageously the classical cocking levers and feeding/extracting mechanisms by a single distributing handle reducing the weapon weight and volume.

The suppression of former parts is optimized thanks to the development of a barrel and fire functions selection device housed in the main handle and the smart integration of a gun rest bipod into the front handle.

The body is thus organised to also integrate a telescopic bayonet/flame mitigator reducing even more the volume, suppressing the setting up matter and guaranteeing the soldier an immediate use and rapid deployment of this accessory.

This body also integrates the systems described in patents 0108250 et 0204731 such as microprocessor management, counter-trigger safety, caseless firing, biometric user identification, magazine compartments sequencing and a computer connexion port.

It is particularly geared towards the small calibre caseless telescopic ammunition firing such as the ones described in these patents. Medium calibre ammunitions, of the smart type (grenade) are organised according to the cartridge back solid propellant mounting, surrounded by a skirt made out of an appropriate material compatible with barrel rifling and ammunition extraction effort during unfired cartridge ejection.

A gas damper, geared towards high specific power ammunitions firing is exposed in this patent in order to counter the recoil effects of heavy ammunitions.

Exploiting the gas propellant, this two formulas damper, thanks to its design simplicity and automaticity, favours the overall lightening of the body.

Said body comprises:

- a central stock,
- three handles aligned under the main stock,
- two barrel units,
- a single barrel control unit,
- a unique breech selector,
- a collapsible bipod,
- a secondary coking lever unit,
- two side-by-side clips integrated into a handle,

- a telescopic bayonet/flame mitigator,
- a central processing unit,
- a fire control (optronics, infrared...) fairing,
- a recoil damper for high impulse ammunition.

PRESENT STATE OF THE TECHNOLOGY

The patent EP 0898 142 A 2 from Sommer + Ockenfuss GmbH describes a repeating arm whose handle also ensures a pump action for ammunition chambering.
This formula, further to its multi-barrel incompatibility due to a handle directly liked to the breech, is characterised by a weight balance penalized by a still classical firing technology and turns out to be incomplete as testifies the absence of bipod for rest firing.

The patent EP 0085 193 A1 de Heckler & Koch GmbH proposes and additional grenade launcher for rifles. Replacing the stock under the barrel, this launcher has its own firing device that intricates and burdens the weapon without offering the flexibility of automatic reloading.

The patent EP 0 759 531 A1of Heckler & Koch GmbH proposes an automatic weapon with two back to back axially mounted barrels whose interchangeability is based on a flip over manoeuvre of the unit. This original formula, aiming at using one or the other barrel, does not allow anything more than the use of a single barrel at a time and, requiring a specific manipulation (flip over of the barrel unit) in the case of a real engagement, thus implies a prerequisite choice from user. Neither integral bipod nor a pump action function for the under-stock has been forecasted.

The patent WO 93/13379 of Colt Manufacturing Company, Inc. describes a grenade launcher adaptation whose particularity is to integrate the M-203 in such a way that the recoil force be exerted in the barrel axis. Offering no automatic reloading, this system is therefore limited.

The US patent No 6 314 672 5 (or EP 0881 453 A2) of Heckler & Koch GmbH presents a weapon body whose architecture aims at providing a large stiffness in order to palliate the fragility introduced by classical lateral cocking levers. This body design is highly similar to the one described in patent No 6 250 194 of the same manufacturer hereby analyzed. This structure turns out to be, due to its volume, highly voluminous thus generating a high inertia when manipulated. No bi-pod has been forecasted, which, for such a bulky and heavy weapon, leads to I depth questions about the inventor's reflexion as still testifies the presence of a cocking lever limited to its own function.

The present patent, on the other hand, concentrates a maximum number of applications (cocking-lever, bi-pod) in a minimum operating levers (a single distributing handle/pump for two breeches) leading to a practical and light solution.

The US patent N° 6 250 194 of Heckler & Koch GmbH presents a coupling system between an assault rifle/submachine gun and an automatic grenade launcher. The integration of both units leads to a bulky weapon, heavy to operate and complex, with two superposed barrels. The firing mechanism is common, housed in the handle and is based on a mechanical coupling between the two units, each with their own cocking lever, thus leading to a penalizing duplication of weight and parts. No pump action mechanism has been forecasted and the both weapons unit is kept into firing position by the hand supporting the front stock, requiring a torsion effort from the wrist thus generating muscular fatigue improper to controlling the site clearance of the weapon. Both barrels are superposed and parallel, this disposition leading, due to their respective feeding systems, to a different length.

This difference is obviously in favour of one calibre and to the detriment of the other. Here, it is the small calibre whose insufficient barrel length is inadapted to the optimum efficiency of the ammunition, without prejudging the risks from misburnt propellant powder. As a matter of fact, a cartridge is always optimized for a minimum barrel length below which the propellant combustion is incomplete and leads to dust susceptible to jam the weapon at short term, without precluding from the power loss of the ammunition. This superposed disposition of the barrels leads to a penalizing weapon length with strong inertia, prejudiciable to its lightness an ease of use.

No bi-pod has been mentioned for rest firing, which means that this accessory, essential when using a sophisticated fire control, should be forecasted with the matching weight and volume increase.

The patent EP 0416 642 A2 describes a small calibre weapon integrating two barrels with dedicated clips, arranged one beneath the other. A fire control mechanism is common to both barrels. The weapon has naturally two cocking levers and its formula cannot be justified, in the present case of two same calibre barrels, unless to prevent a possible jamming of one of them as well as improving the fire autonomy. Out of this two advantages highly disputable when compared with a lengthened magazine or two clips heads to tail assembled as practiced to-day, the formula leads to numerous inconvenient.

As such is the weight (two barrels, two striking blocs...) and parts number increase, without prejudice of the weapon volume caused by the differential length introduced by the superposed barrels formula.

The Lacroix Tous Artifices patent FR 94 07230 introduces a surimposed twin-barrel firearm intended for different gauge ammunitions. The weapon, supposed to be suspended under the forearm, brings numerous ergonomics interrogations unapproached by the inventor: muscular fatigue resulting from the hanging weapon, shooting accuracy with a free-floating weapon, yaw control, no clip replacement without dropping the weapon...

Surimposing the gauges brings the ticklish problem of differential barrels length, leading to shortening one in favour of the other. Inventors preferred a 90° arrangement of the magazines to palliate this inconvenient to the detriment of the general volume of the firearm.

Inventors came out with a particular cartridge chambering process based on a rotation of the barrel whose window opening, initiated when facing the feeding compartment or magazine, should allow for cartridge introduction. The backside of the barrel is obturated and works as "mortar effect".

The inventors do not specify how the ammunition travels from the magazine to the chamber/mortar and barrel rotation indexation (line 33, page 4) would not suffice to convince the man of art of the lack of feeding problem. As a matter of fact, this operation turns out to be quite impossible when considering the drawing (fig. 3, drawing 2/4) furnished by the inventors since the clip compartments are side-by-side arranged and cartridges will obviously telescope each other during their presentation phase leading to jam. A solution would consist in adopting, as scheduled in patent FR 0108250 owned by the author of the present patent, a differential slope angle for the sidewall of the magazine. Further, no precision has been furnished as to the magazine loading process nor its engagement or positioning onto the weapon: conceived as presented, the magazine is not viable since no device to keep the ammunitions in place is mentioned.

No device to keep the ammunition tight in the chamber before firing is neither described: the sole rifling inside the barrel would never bring an answer, if no the ammunition would condemned to fall as soon as the barrel is tilted down ! No extraction device either. This might be put on the prevision, by inventors, of a hole at the back of each case in order to initiate its own ejection during shooting. This original formula weakens the ammunition by rupture of the sealing and brings the problem of extraction/ejection without firing a chambered cartridge. As a matter of fact, chambering a cartridge does not mean its systematic firing (training, failing cartridge...) and a sole magazine removal (which does not seem to be the case here) followed by barrel rotation would, possibly, open the feeding window and authorize the gravity fall of said engaged ammunition.

The firearm integrates a friction damper, furthermore described in patent FR 92 13428, for large calibre and high specific impulse ammunitions. This damper drawback is to require a somewhat long travel penalizing the overall weapon size and to be particularly sensitive to outside greasy or liquid agents susceptible to degrade the performances. We shall see that the use of propellant gazes for the damper, such as described in the present patent, frees the user from the risky presence of oils, greasy agents or water, inherent to weapons and otherwise susceptible of being highly prejudicial to a friction damper when firing some high impulse ammunition.

In short, the ergonomic of the Lacroix formula limits the weapon use, its feeding system with no extraction device leading to easy jamming, its damper being penalizing in term of overall size and its formula risky in regard to the current presence of some greasy agent in a weapon. No bi-pod is either integrated and the 90° disposition of the clips adds even more to the overall size.

DESCRIPTION OF THE INVENTION

The invention comprises a body for personal firearm intended for semi-auto and automatic firing with two different bore barrels mounted parallel, horizontally and side-by-side. This disposition suppresses the inconvenient of a surimposed mounting leading to a differential length for barrels and assures them an optimal sizing for the best ammunition efficiency. As a matter of fact, the surimposed barrel disposition requires the consideration of the feeding system volume, usually representing 25% of the weapon length, leading to an equivalent length amputation of the corresponding barrel.

This body offers a particularly ergonomic handling of the firearm thanks to its original conception based on a central tapered stock, with a preferred hexagonal section, underneath which three handles are positioned: one at the centre and one at each end. The organisation and presence of these handles are geared to assuming several roles or functions described hereby.

Front handle:

- Assures a triple role: ergonomic, common cocking lever for both barrels and integrated bi-pod.
- Reduces the number of parts and the overall size with the integration of a telescopic bi-pod with automatic deployment.
- Brings a prime advantage in terms of reactivity to the user with a fraction of a second bi-pod deployment.
- Counters the recoil lift up during shooting.
- Transfers a pressure according to the central axis to ensure a comfortable weapon handling and reduce user fatigue by countering the recoil effect, especially during burst firing.
- Suppresses the lift up and erratic deviation of the weapon unknowingly induced to user during a support handling of a classical weapon. As a mater of fact, during the shooting an elevation movement occurs combined with an azimuth deviation resulting from the back tilting of the shooter's bust combined with a lateral pivoting of his shoulder under the recoil effect, reducing suddenly the apparent weight of the weapon. The shooter has thus the tendency, in spite of him, to increase the weapon lift-up occurred by the recoil.
- Suppresses the fatigue induced by the support of the weapon and the wrist twisting required by classical hand-shields (Famas, M-16...) and provides a natural hand position remaining in the wrist axis.
- Guarantees a noticeable reactivity to user in case of faulty cartridge ignition by conducting the introduction/extraction manoeuvres from the front handle, without modifying the weapon handling to seize a cocking lever as with most of classical firearms (Famas, M-16, Styer-Aug...) that exposes dangerously the shooter.

The central handle:

- Ensures a rapid barrel selection thanks to an ergonomic selector located under the trigger-guard.
- Ensures the measured lazed range increment thanks to an ergonomic selector (64) activated by the shooter's thumb.
- Integrates the housing for the weapon electronic management and batteries.

The aft handle :

- Ensures a perfect and constant weapon resting against the shooter's shoulder for the best accuracy, particularly in reactive shooting.
- Provides a shortening of the weapon with an aft set of the barrel(s)/chamber(s) unit above shooter's shoulder.
- Ensures the positioning of the barrel middle axis above the shooter's shoulder in order to systematically present the aiming line in front of said shooter's eye, reduce head tilting and favour reactive shooting.
- Combine the housing for two side-by-side clips with a stock function.

The back and central handles:

- Allow for a particularly strong two hands grip for bayonet use.
- Increase, in that configuration, the weapon stretch out.

The front, central and aft handles:

- Offer an exceptional ergonomic handling of the weapon to favour a position for precision shooting and best recoil damping, noticeably in counter lift-up.

The « bull-pup » design of the body is improved here by a pronounced aft positioning of the barrels whose fairing (1) extends beyond the back of the stock/housing for clips, forming an ergonomic busc (5) guaranteeing thus a strictly identical handling during each shot, especially for reactive shootings when aiming is often erratic. As a matter of fact, a 10 to 20 m/m site shift of the stock on the shoulder is easily observable on weapons equipped with classical stocks, leading to a change in shooter's head position as well as alignment of the aiming line with the eye.

This new weapon configuration offers thus a noticeable advantage by directly presenting the aiming reticule in line with shooter's eye limiting the head tilting and aiming delay.

The components disposition (stock and handles) is moreover particularly adapted to the weapon raise control during fire. As a matter of fact, the presence of a front handle eases the shooter to produce a containment effort of the diving moment type naturally countering any weapon raising tendency during a burst shooting.

This body is absolutely ambidextrous thanks to a barrel selector (16) located on the central handle (2) ensuring the double function of bore selection (right or left side) and (central position) laze shootings. The weapon electronics ensures an automatic reticule presentation in the collimator as well as shooting parameters for the selected ammunition.

A telescopic bayonet (13), surrounding the small calibre barrel on a portion of its length, ensures simultaneously the flame-mitigator function when deployed.

Description of drawings 1 to 8/8

The drawing 1/8 shows one figure (1) describing a cutaway view of the body at the small bore barrel level.

The drawing 2/8 shows one figure (2) describing a cutaway view of the body at the large bore barrel level.

The drawing 3/8 shows four figures (3, 4, 5 & 6) describing the side-by-side clips arrangement with breeches selection/locking devices.

The drawing 4/8 shows one figure (7) describing the handle/pump/bi-pod unit mechanism.

The drawing 5/8 shows one figure (8) describing a cutaway view of the firearm with deployed bi-pod.

The drawing 6/8 shows five figures : fig.9 describing the OO' cutaway of constituting elements for the handle/pump/bi-pod unit, fig.10 describing the cutaway of the cocking lever bar support/guide unit in retracted position and fig.13 presenting the seen from under view of the body with its extension/retraction cone for pump/handle halves.

The 7/8 drawing shows five figures (14, 15 & 16) presenting the telescopic bayonet mechanism and the ergonomic increment selector for the range meter.
The 8/8 drawing shows three figures (17, 18 & 19) presenting the high impulse ammunition damper system with its regulation valve.

BODY DESCRIPTION AND OPERATING MODE (drawings 1/8 to 8/9)

The selected body (1) for demonstrative purpose is preferably but not exclusively of the assault rifle type, the principle of the invention being applicable to all calibres and types of light firearms. The body comprises a main frame, body or stock integrating a bedding (6) in which the barrels (8 &9) are affixed thus including a limited number of parts. Such a characteristic should lead to important economic consequences in term of production cost, shooting accuracy and maintenance.

The weapon includes (drawings 1 to 8/8):

- (1) central stock, main frame or body,
- (2) central handle,
- (3) front handle/pump,
- (3 bis) half front handle/pump,
- (4) back handle/stock,
- (5) ergonomic busc,
- (6) barrels bedding,
- (7) small calibre barrel,
- (8) medium calibre barrel,
- (9) lower calibre breech recoil spring (recuperator),
- (10) large caliber breech damper,
- (11) alternate frontsight,
- (12) alternate gunsight,
- (13) telescopic bayonet,
- (14) small calibre breech,
- (15) large calibre breech,
- (16) barrel selector,
- (17) small calibre clip arrester,
- (18) large calibre clip arrester,
- (19) connexion port,
- (22) tandem compartment small calibre clip,
- (23) large calibre clip,
- (24) thermal sensor for cook-off threshold,
- (25) batteries or spare cartridge for fuel-cell battery,
- (26) steering stem and fork for breech command shaft (27),
- (27) breech cocking rod,
- (28) front position recoil runner for breech cocking shaft (27),
- (29) small calibre breech housing for cocking shaft (27) hook,
- (30) large calibre breech housing for cocking shaft (27) hook ,
- (31) breeches cocking shaft hook,
- (32) vertical flat front face of cocking shaft hook,
- (33) breeches swing locker/selector,
- (33 bis) slit or swing (33) locker/selector arm housing for breech selection,
- (34) pump/handle trigger,
- (35) bi-pod telescopic deployable parts (two),
- (36) bi-pod telescopic deployable parts arrester,
- (37) telescopic deployable bi-pod parts length adjustment arrester,
- (38) telescopic deployed bi-pod parts erasable locker,

- (39) handle base block for the pump/handle unit,
- (40) roll clearance effaceable neutral abutment of the steering/base block,
- (41) steering/base block coupling shaft with unit (50),
- (42) pivot/support unit for both pump/handles halves,
- (43) half handle casing/support,
- (44) locker for pivot/support unit (42) in its steering/base block (39) housing,
- (45) yaw clearance effaceable neutral abutment of pivot/support unit (42),
- (46) lateral clearance axis for half pump/handle,
- (47) half pump/handle deployment split spring (spiral or U shaped),
- (48) half pump/handle split angular abutment,
- (49) half pump/handle retracted position side bar,
- (50) steering block for cocking shaft and alternate cocking lever,
- (51) alternate coking lever,
- (52) alternate coking lever section enlargement,
- (53) alternate coking lever busc,
- (54) alternate coking lever extended position recoil spring,
- (55) smooth link (rotule, axis... debating in site and azimuth) between the shaft and steering block (50),
- (56) steering rod for the pump/handle unit,
- (57) recoil spring for steering block (50) unit,
- (58) cocking rod and alternate lever steering block (50) unit course abutment,
- (59) travelling groove for erasable neutral abutment (40) of the steering block (50) unit,
- (60) pump/handle unit clearance window,
- (61) half pump-handle deployment/retraction cone,
- (61 bis) course travel opening for pump/handle,
- (62) cocking rod raising cam,
- (63) breeches swing locker/selector spring,
- (64) rectangular lever (or crescent shaped to be activated by shooter's thumb),
- (65) telescopic bayonet arrester,
- (66) harmonized flame mitigator opening,
- (67) cartridge arrester,
- (68) shooting parameters display screen,
- (69) fire control fairing,
- (70) battery housing (fuel cell),
- (71) recoil absorber piston,
- (72) cylinder for recoil absorber piston,
- (73) gas port pipe,
- (73 bis) gas pipe for cylinder damper,
- (74) distribution/regulation floodgate,
- (75) drawer,
- (75 bis) drawer adjustment screw,
- (76 & 76 bis) switch pipe,
- (77) drawer return spring,
- (78) recoil spring,
- (79) bleed pipe,
- (80) breech recoil guiding rod,
- (81) guiding rod abutment,
- (82) sealing piston head.

BARRELS SELECTION/DISTRIBUTION (drawing 3/8, fig. 3 to 6)

Breech/barrels selection

Barrel or bore selection is operated via a two to three positions selector (16) (left-neutral-right) located on the central handle (2) under the trigger-guard in order to be permanently accessible by the major finger. This selector includes at its end a mechanism (fork, locking pin ...) cooperating with the breech cocking shaft/rod in order to favour the switching of said rod towards the appropriate breech (14 or 15) for its engagement simultaneously following said selector switching.

This selector ensures the laser rangefinder triggering when a pressure is applied as well as the simultaneous presentation of selected calibre parameters in the fire control sight.

Breeches manoeuvre/engagement (drawing 3/8, fig. 3, 4, 5 & 6)

In order to assure a failure free engagement of each barrel breech (14 & 15) by the cocking rod (27), said breeches are characterized in that they include on their lower side face a housing (29 & 30), machined in depth in the mass, symmetrically female shaped to the rod (27) end integrating a hook (31) with which they cooperate.

The rod hook (31) has a flat face (32) perpendicular to the axis of said rod in order to generate a strong push on the breech during the back travel of the pump/handle (3), as well as a tilted face for the breeches female housing hook engagement during a forward return of said breeches.

The female hook of breeches housings (29 & 30) is to be side engaged par that (31) of said rod and said housings are so conceived that they authorise a vertical clearance of said rod to favour the disengagement of its own hook (31) from the breeches female hook when raised. In that case, the rod end stays always, under the distributing action of the steering stem of the breech selector, engaged in the selected breech housing in order to ensure, during a pump/handle back travel, the backwards movement of said breech.

Such a vertical clearance of the rod inside the breeches housings is intended for a double goal:

- Guarantee that the rod always ensures the back travel of breeches during a pump/handle manoeuvre with upside-down firearm,
- Ensure, in normal operating mode, the rod hook (31) engagement by the breeches during a forwards back travel under their return spring action.

A sufficient clearance will ensure a friction free side engagement of the breeches housings by the rod.

Rod/breeches coupling device (drawings 1/8 & 3/8, fig. 1, 3, 4, 5 & 6)

In order to authorize the breech recoil during shooting, a rod/breech unlocking device is implemented at the trigger level. This device ensures, when a pressure is applied on the trigger, a rising of the cocking rod (27) by a cam integral with the trigger and set up in direct contact with said rod or via a vertical bushel moved by said cam. A pressure applied on the trigger initiates an upwards movement of the cam which raises the cocking rod and causes its desolidarisation from the matching breech (14 or 15) and this as long as the trigger remains depressed. Therefore there is no hooking risk of the breech during a sustained fire (burst).

As soon as shooting stops when trigger is released, the rod lowers down and the breech comes to engage the hook of said breech during its forwards movement.

Operating principle (drawings 3/8, fig.3, 4, 5 & 6)

When the barrel selector is swung right or left, its steering stem (26) causes the movement of the corresponding rod (27) whose end comes to engage the matching housing of the concerned breech (14 or 15). In order to avoid that a violent backwards inertial shock applied on the weapon central axis causes the backtracking with an untimely opening of the unselected breech whose female hook housing had not been engaged by said rod (27), a locking device for said unselected breech has been implemented.

Selective breech locking device (drawings 3/8, fig. 3, 4, 5 & 6)

This device includes slits or housings (33 bis) located on each breech and a swing locker/selector (33) V or crescent shaped characterized in that it be mounted in front of the slits between the two breeches and articulated according to a parallel axis to the weapon's one, in such a way that the cocking rod (27) passes inside the V to cause, during a side move of said rod, a swing movement of the locker of which a branch comes to engage the slit (33 bis) of the unselected barrel to lock it and simultaneously clear the selected breech's one to liberate it. A compression spring pushing at the V or crescent base will ensure a net and precise swing.

INTEGRAL PUMP/HANDLE ROLE AND DESCRIPTION (drawings 4/8, 5/8 & 6/8, fig. 7 to 13)

The pump/bi-pod/handle unit includes the following elements:

1. The bi-pod integrated unit comprising:
   - (42) a pivot/support unit for both pump/handles halves,
   - (3) a front handle composed of two side-by-side half-handles (3 bis),
   - (43) a casing/support for each half-handle,
   - (46) lateral clearance axis per half pump/handle,
   - (47) a half pump/handle deployment split spring (spiral or U shaped),
   - (49) a half pump/handle retracted position pin,
   - (35) two bi-pod telescopic deployable parts,
   - (36) a bi-pod telescopic deployable part arrester per handle,
   - (37) a telescopic deployable bi-pod parts length adjustment arrester per handle,
   - (38) a telescopic deployed bi-pod parts erasable locker per handle,
   - (48) a split angular abutment for each half pump/handle.
2. A steering/base block (39) unit for said bi-pod:
   - (39) a handle base block for the handle/bi-pod unit,
   - (34) a trigger integral with the support/guide block (39) of the pump/handle unit,
   - (40) a roll clearance effaceable neutral abutment for the steering/base block (39) of the pump/handle unit,
   - (41) a shaft for coupling the handle base block (39) of the pump/handle unit with the cocking rod unit (50), and to simultaneously retract the cocking lever (51),
   - (44) a locker for pivot/support unit (42) in its steering/base block (39) housing,
   - (45) a yaw clearance effaceable neutral abutment of pivot/support unit (42) of half pump/handles,
3. Support/guide block (50) of the rod (27) and cocking lever (51) unit:
   - (50) steering block for cocking rod and alternate cocking lever,
   - (51) an alternate retractable coking lever,
   - (52) alternate coking lever section enlargement,
   - (53) alternate coking lever busc,
   - (54) alternate coking lever extended position recoil spring,
   - (27) a breech cocking shaft/rod,
   - (55) a smooth link (rotule, axis... debating in site and azimuth) between the shaft and steering block (50),
4. A steering device for the pump/handle/bi-pod unit:
   - (56) steering rod for the handle base block (39) of the pump/handle unit and steering block (50) for shaft (27) and cocking lever (51),
   - (57) recoil spring for steering block (50) unit,
   - (58) cocking rod and alternate lever (51) steering block (50) unit course abutment,
   - (59) travelling groove for erasable neutral abutment (40) of the steering block (50) unit.

5. A tapered window (60) for the pump/handle unit clearance located at the front of the lower face of the main stock:

   - (60) pump/handle unit clearance window,
   - (61) half pump-handle deployment/retraction cone,
   - (61 bis) course travel opening for pump/handle.

Operating principle

Manoeuvring the pump/handle/bipod unit is obtained by pressing the trigger (34) to initiate a backwards movement to chamber a cartridge or a frontward movement to deploy the integral bi-pod.

Cartridge chambering/extraction

During the backtrack of the pump/handle the cocking rod, after selection of the appropriate barrel and engagement of the matching breech housing, draws said breech backwards for cartridge extraction. The breech and rod are linked together by the hook (31) in order to prevent any untimely opening of the selected breech under an inertial shock. Remember that the swing locker/selector freezes the other breech.

Integral bi-pod deployment

The bi-pod integration to the pump/handle provides the most advantageous room and weight saving for the best ergonomic.

The deployment of the bi-pod is obtained by pressing the pump/handle trigger (34) then pushing the handle frontward taking care of opening the hand to favour the immediate splitting of both half-handles. This action disunites the handle base block (39) from the steering block (50) of the cocking rod (27) and alternate lever (51). The steering block (50) remains in course abutment (58) of the steering rod (56) which is screwed/pinned at its end to the body the trigger side of the weapon. The rod adopts an oval section (with vertical main axis) for the length corresponding to the steering block (50), rod (27) and alternate lever (51) course, then, on the remaining length adopts a round section whose diameter is equal to the large axis of said oval section. Such a disposition ensures an abutment effect (58) for the steering block (50) whose rod (56) travel channel section is matching said oval rod, preventing any further overshoot of the scheduled course. The channel through handle base block (39) of the pump/handle unit is, on the other hand, round to ensure said pump/handle unit sliding over the whole rod (56) length.

The steering rod (56) bears two notches for trigger (34) engagement matching two positions: neutral (alternate lever at rest) and deployed bi-pod, as well as a travel groove (59) for an erasable abutment (40) of roll neutral positioning (vertical) of the handle base block (39) of the pump/handle unit.

The forwards movement of the pump/handle unit leads to the deployment of the following elements (drawing 4, 5 & 6/8, fig. 7 to 13):

- alternate cocking lever (51) swung down resting in retracted posture under the action of the shaft (41) coupling the handle base block (39) of the pump/handle unit with the cocking rod unit (50), of lever (51), said shaft cooperating with the busc (53) to assure the deployment, assisted by the return spring (54), or the retraction of said lever (51) following a two blocs (39 & 50) splitting or merging.
- half-handles (3 bis) unlocking and maintained side-by-side stretched by the alternate lever (51) who, in horizontal position, applies a vertical up pressure on the side-bars (49) favouring said half-handles resembling.
- half-handles split angle opening, under the action of split springs (47) (or a single U shaped spring), during the engagement of tapered opening (61) of the window (60) located under the body.

- automatic bi-pods extension by telescopic elements arresters (36) opening who, during the forward movement of the pump/handle unit, stretch against the alternate (51) coking lever section enlargement (52) causing their unlocking.
- maximum half-handles splitting who, when the pump/handle unit reaches the course limit abutment, quits reposing against the tapered (61) part of the window (60) arranged under the body to rest against the split abutments (48) in deployed position.

The engagement by the trigger (34) of its front abutment housing ensures the steady pump/handle unit deployment.

The bi-pod presents then the following advantages:

- rotation capability after abutment (40) clearing, around the steering rod with a split clearance limited by the tapered (61) part of the window (60) arranged under the body, noticeably appreciable for gravity aimsight correction.
- yaw rotation, after neutral abutment (45) clearing of pivot/support unit (42) of half pump/handles to offer some aimsight azimuth screenings, the trigger (34) ensuring the role of angular clearance abutment.

Note: the nature of the invention would not be changed if the handle base block (39) for the pump/handle unit and the support/guide (50) for cocking rod (27) were guided by one of the barrels of the body, the course abutment (58) of the second block (50) being then posted on the body frame.

Bi-pod retraction during the backwards movement of the pump/handle unit is conducted with the following operations (drawing 4, 5 & 6/8, fig. 7 to 13):

- a pressure on the trigger (34) followed by a backtrack (place a flat hand on both handles) of the pump/handle unit for engagement, after neutral setting of the pivot/support unit (42) for both pump/handles halves, of the tapered (61) part of the window (60) arranged under the body by the half-handles causing their progressive joining.
- when the handle base block (39) of the pump/handle unit comes into contact, after neutral setting by the erasable abutment (40), with the steering block (50) of the cocking rod (27), its shaft (41) penetrates its matching housing of said steering block causing its horizontal retraction towards the body front.
- the alternate lever (51) exerts a pressure on half pump/handle retracted position side bars (49), forcing their joining and suppressing any friction during the pump movements in its course groove (61 bis) located under the body.
- depress the telescopic element length adjustment arrester (37) for each half handle in order to retract them in their housing with care of clearing the lockers (38) (it is preferable to initiate this operation once the trigger (34) has engaged its pump function abutment housing, to avoid the risk of putting the telescopic elements arresters (36) in contact with the alternate coking lever section enlargement (52) causing their unlocking).

Pump/handle/bi-pod unit mounting/dismantling (drawings 4/8, 5/8 & 6/8, fig. 7 to 13)

After withdrawal of the upper part of the body frame, engage the steering block (50) for cocking shaft and alternate cocking lever on the steering rod (56) by the oval section side. Then engage by the other side (round shaped section of the rod) the handle base block (39) for the pump/handle unit taking care to beforehand mount the pivot/support unit (42) for both pump/handles halves and join it together with the locker (44) for pivot/support unit (42) that will preferably be pinned in its handle base block (39) housing. Make sure that block (42) rotates perfectly once mounted. Push/screw the oval section rod into its body housing and pin the unit after indexation (larger axis of oval section vertically set).

The mounting of half-handles into the steering/base block (50) is conducted by engagement of the rotation axis of each half-handle casing/support (43) in their matching housing of block (42) taking care to position and compress their return spring (47), then pinning each half-handle with an axial pin. Another half-handle split open position recall formula would consist in a single inverted U shaped spring whose branches would engage a slit housing arranged in each half-handle casing/support (43) or even more the single piece realisation of the block (42) with both half-handles casing/supports (43) out of a composite material with a resiliency adapted to said half-handles splitting.

The telescopic elements (35) of each handle are made out of a similar technology to that of cartridge magazine (folded welded metal sheet, composite, extruded profiles...) manufacturing. A single spring, housed in each half-handle (composite, foundry...) is enough for a full leg deployment. The length adjustment of each leg is obtained by pressing onto the arrester (37) in order to engage the appropriate notch.

Surpassable solidarisation of both telescopic elements (35) in extended position is obtained via an erasable pin (38) either by inertial shock (hand palm applied at leg's tip) or by pressing the notch extremity. The assembly of half-handles with their casing/support (43) is obtained by encasing and pining. The bi-pod telescopic elements arrester (36) in retracted position is preferred integral with the casing/support (43) and may advantageously be made out of composite in a single part with said casing.

ERGONOMIC CONTROL DEVICE (drawing 7 /8, fig. 15)

The present body being intended to receive a modern firecontrol unit (infrared, optronics...) integrates for shooter's ease a whole set of commands whose ergonomic participates of the same efficiency and simplification research as for the pump/handle/bi-pod unit. Thus an ergonomic control device is implemented, including a selector (64) (square or crescent shaped to accommodate shooter's thumb) on each side (ambidexterity) of the central handle in order to be activated by shooter's thumb. A forward thumb pressure generates a swing or movement of this lever with concomitant action at the fire control level. This lever is repeated on both firearm sides for perfect ambidextrous use of the body. An immediate application of this set is the modification at will of the fire range (incrementation/decrementation by one or two meters steps for example) previously elaborated by a range meter triggered by a pressure on the barrel swing-selector (16), or be mounted on any type of weapon (automatic handguns...) having a magazine included in a handle in order to activate the magazine arrester to initiate said magazine ejection with a simple forward thumb pressure without requiring a hand to leave said weapon.

TELESCOPIC BAYONET/FLAME MITIGATOR (drawing 7/8, fig. 14 to 16)

In order to reduce the overall weapon weight and volume, as well as the number of operations a soldier must accomplish during a stress phase, the present body integrates a telescopic bayonet (13). This bayonet is characterised in that it be composed of an open tube, tapered at one end, telescopic and sliding mounted around a barrel (preferentially the small calibre one). A spring arrester (65), integral with the bayonet, engages two arresting notches located on said barrel, one near the bedding (6) and the other at the end, respectively corresponding to the retracted and extended position.

Openings (round, oval, rectangular...) (66) eventually harmonized with the barrel rifling are arranged at the circumference of the bayonet in such order that, when extended, they act as a flame mitigator. This bayonet integration is particularly advantageous since it leaves the soldier the benefit of its personal dagger (acting as a prior bayonet) as ultimate defence/survival mean should he loose his weapon. Moreover, the integration of this accessory inside the weapon suppresses all fastidious and time consuming mounting/dismantling operations, reduces dangerous handling operations and offers the possibility to be set up only when required, combining advantageously the flame mitigator function.

Such a bayonet may advantageously be adopted on a single barrel weapon.

RECOIL ABSORBING SYSTEM (drawing 8/8, fig. 17, 18 & 19)

The present body incorporates a gas recoil absorber system intended to reduce the recoil effect of high specific impulse ammunitions, especially for caseless ones. The breech head (15) constitutes a sealing piston according to patents n° 0204731 and 0300520 stipulations of the same author. The course of its alternative backward/forward travel is ensured by a breech recoil guiding rod (80) integral with the barrel/chamber unit for a precise guidance.

The recoil absorbing system includes:

- a breech recoil guiding rod (80),
- a guiding rod abutment (81),
- a recoil absorber piston (71),
- a cylinder (72) for recoil absorber piston (71),

- a gas port pipe (73) at the level of the piston head (82),
- a gas driving pipe (73 bis) towards the recoil absorber (72) cylinder,
- a distribution/regulation floodgate (74) including:
    - a drawer (75),
    - a drawer adjustment screw (75 bis),
    - two switcher pipes (76 & 76 bis),
    - a drawer return spring (77),
    - a recoil spring (78).

Operating principle

When shooting an ammunition, propellant gazes are tapped (73) at the piston head (82) level to be conducted, via a distribution/regulation floodgate (74) and a gas pipe (73 bis) arranged in the breech (15) recoil guiding rod (80), to a cylinder (72) inserted into a guiding rod abutment (81) housing pinned onto said rod. The cylinder (72) houses a piston (71) located in the barrel axis and at the back of the breech (15) of which it is integral with. The distribution/regulation floodgate (74) ensures the progress of propellant gases towards the recoil absorber cylinder during their pressure rise and towards the bleed pipe (79) during their pressure decrease.

The bleed pipe (79) runs alongside the barrel in order to open onto its end to prevent any gas leak inside the weapon.

The bore of this pipe (79) is less than that of the feeding channel (73 bis) for recoil absorber to produce a gas flow differential during the pressure decrease.

The distribution/regulation floodgate (fig. 17 & 18, 74) includes a drawer (75), integrating two gas switch pipes (76 & 76 bis), mounted sliding in a housing (squared, oblong...) preventing any self rotation of said drawer. The drawer is kept into position by a return spring (77). The floodgate is connected to the gas port pipe (73) of the piston head (82), to the cylinder damper (73 bis) and bleed (79) pipes in order that when the drawer is at rest (fig. 19), the switch pipe (76 bis) ensures the communication of the gas pipe for cylinder damper (73 bis) with that of the bleed pipe (79) and the simultaneous closure of the gas port pipe (73) of the piston head (82). This disposition constitutes a free air bleed for the recoil absorber to favour the breech backtrack during a shooter's manual action.

During the cartridge ignition the tapped gas at the chamber level exert a pressure to displace the drawer (fig.18), stretching its return spring, such that the swing pipe (76) puts the gas port pipe (73) into communication with that of cylinder damper (73 bis) with a flow equal to nominal of said gas port pipe (73). Simultaneously this drawer displacement produces the bleed pipe (79) closure during the recoil absorber inflatement.

The absorber piston bore is, on the other hand, such that it represents a fraction (1/2 for example) of that of the sealing piston head (82) or breech (15). Thus, the pressure exerted by said breech during the departure of the ammunition generates a recessing of said piston (71) into its matching cylinder (72) ensuring an initial recoil absorption in due proportion of the absorber piston bore and sealing piston head surfaces ratio. During this time the ammunition travels into the barrel with a pressure lowering in the chamber up to become quickly inferior to that in the recoil absorber cylinder (72). The regulating drawer (75) closes then and the switch pipe (76 bis) ensures the communication of the gas pipe for cylinder damper (73 bis) with that of the bleed pipe (79) at a flow in due sections proportion in order to ensure a controlled "deflating" of said absorber.

This effect generates a progressive and continuous recess of the recoil absorber piston (71). When the ammunition leaves the barrel, the pressure suddenly falls to zero on the side of the breech head (15) which continues its travel towards the back of the weapon under the stored energy (movement quantity) effect.

The shock absorber cylinder keeps on "deflating" via the bleed pipe (79) and continuing its absorbing effect, combined with the compression one of the recoil spring (78), until the breech reaches its course end. The return spring takes then over to ensure the forward breech return with a new cartridge introduction.

The resulting damping effect is spread over the whole piston (71) course. A change in the pistons (71) and breech sections ratio permits to modulate the effects, especially at chamber opening.

Thus, a near to 1 ratio leads to breech locking, during ammunition travel in the barrel, detrimental to the device shock absorbing effect. As soon as said ammunition exits, the store energy is dissipated during piston recoil driving the gases through the bleed pipe. A near to ½ ratio will produce a half recoil of the weapon.

A judicious flow (79) dosage of bleeding gases via the distribution/regulation floodgate (74) may be obtained with an adjustable tuning of the drawer (75) via a screw (75 bis) in order to increase or reduce the facing of the switch pipe (76 bis) and bleed pipe (79) sections.

The initial recoil damping effect is equal to the breech and shock absorber pistons sections ratio. An appropriate value of this ratio may be adopted to create a delay effect at breech opening.

Note: the sealing principle of the recoil absorber piston (71) follows that of the breech (15) as related in patents n°0204731 and 0300520 of the same author. Thus a self expanding corolla (under gas pressure) placed at piston's head will guarantee a perfect sealing to the damper. The present system is furthermore compatible with cased ammunitions firing should a gas port be advantageously positioned at the case rim level whose presence generates however a to the gas feeding retard due to the ammunition/case separation delay during which the breech recoil cannot be subdued.

FUEL CELLS (drawing 2/9, fig. 2)

Housing a modern fire control (infrared, optronics...) generates electric consumption problems that fuel cells may overcome. In such a forecast, the body integrates a housing (70) for a fuel cell and its fuel cartridge located into the stock/handle (4) behind the magazines housings (22 & 23). This disposition allows for any future housing volume increase via a simple lengthen of the aft part of the stock/handle (4), busc (5) and main body (1) without requiring a perceptible weapon modification but its length.

ELECTRONIC ADVANTAGES FOR THE WEAPON

The introduction of electric power and microprocessors leads to a simplification of the mechanisms, therefore a weight reduction, and to the integration of particularly important new functions:

- detection of a cartridge in the barrel chamber,
- selection between single and full-auto fire from the trigger,
- selection of the number of shots fired during full-auto burst,
- cartridges counter,
- number of shots per accredited user,
- total shots counter (barrel wear),
- clock: date and hour of the shootings,
- recording: the central processing unit comprises a memory size making it possible to restore all the elements of a shooting (user, date & hour, a number of shots...),
- fire safety with automatic fingerprint recognition of the accredited(s) user(s),
- authorized users registration,
- automatic control of the type (short, long...) of magazine engaged in the weapon,
- low batteries alarm.

FIRE SELECTION

The trigger constitutes a true three positions sealed rotactor whose axis is confounded with trigger's one. The shot by shot or full auto is then obtained by progressive rotation of the trigger. The fire rate programming as well as the number of ammunitions shot during a burst is conducted by a simple plugging the weapon to a computer (access by code and authentification).

FUNCTIONS DISPLAY

The weapon, in addition to its firecontrol parameters display capability, integrates an additional display screen (68) for the following informations:

- cartridge presence in the chamber,
- remaining cartridge counter,
- fire clearance,
- selection: single or burst,
- time & date,
- accredited users name (or codes),
- battery.

In order to get essential information (shooting authorization, remaining cartridges, fire selection) the display screen will advantageously be located (fig. 1, n°68) at the back of the weapon body, in the aiming sight axis in order to be permanently visible by the shooter. This screen presence is important, especially in case of firecontrol failure that might lead shooter to abandon it.

SHOOTING RECORDING

The electronic circuit of the weapon comprises a clock and a memory whose information is displayable on said memory interrogation via a port, located at the back of the central handle.

The retrieval of this memory makes it possible to restore all use elements of the weapon:

- shootings date & hour,
- fire selection (single or burst),
- user identity,
- number of fired ammunition,
- date & hour of users accreditation,
- total of fired ammunitions over a period (e.g. year),
- statistics (barrel ageing...).

Cartridges counter

The knowledge of the number of remaining cartridges in a weapon has always been crucial information for the user. Still today, the absence of counting system obliges the user to a differential computation between the consumed cartridges and the initial capacity of the weapon in order to determine the number of remaining ammunitions.

In order to ease the determination of the number of remaining cartridges, the weapon integrates a cartridge counter device by registering the presence of a cartridge in the chamber and the knowledge of the position of the front and aft conveyers of the magazine.

The use of an incompletely loaded magazine having no possible justification unless for training purposes, it is thus enough to know, for an operational use, the upper or lower position of each compartment conveyer to deduct the number of remaining cartridges prior to shooting.

For this purpose, the magazine well is equipped with contactors located inside the frame at the top and bottom of the motion sliding groove of each button of conveyer.

The information of position of each button thus collected is transmitted to the central microprocessor which assigns a value, contained in its memory and abounded of the detection of a possible presence of cartridge in the barrel, reflecting the total capacity of the weapon. The distinction between various models of magazines (short, long...) follows the same principle: a contactor located in the weapon magazine well allows the central processing unit calculation, if actuated, to identify the type of magazine and to display the information relating to effective capacity according to the conveyers position and the information of presence of a cartridge in the barrel.

For each shooting the central processing unit substracts an ammunition to the computed total and carries the result to the screen. This method, inexpensive in term of production, does not make it possible however to know the instantaneous capacity of a partially furnished magazine engaged in the weapon.

For this purpose, the magazine well may integrate a sensor scale to detect the passage of a marker (magnetic, electroluminescent...) located on the conveyer of each compartment. Spacing between each sensor corresponds to the displacement of the conveyer during the withdrawal of a cartridge from the corresponding compartment.

The referencing of the position of each sensor will make it possible the central processing unit to determine the capacity of each compartment and abound it of the possible presence of a cartridge in the barrel to establish the instantaneous capacity of the weapon.

Note: the number of shots may be determined by the number of discharges actually entered to the igniter (no electrical contact in the absence of cartridge) or by inductive currents in the case of an inductive igniting process.

RESISTANCE TO ELECTROMAGNETIC FLASHES AND OTHER INDUCTIVE CURRENTS

The weapon according to the invention must be capable of irreproachable operation whatever may be the environmental conditions (violent storms, strong radars radiation, nuclear electromagnetic flashes ...). For this purpose, necessary shielding of the vital elements (central processing unit, identification memories block ...) will be adopted in order to guarantee a perfect insensibility to these phenomena.

ADVANTAGES OF THE BODY ACCORDING TO THE INVENTION

The twin barrel body conception offers numerous advantages compared to present solutions, especially in terms of greater accuracy and firepower. These advantages are inventoried as follows.

Accuracy

The barrels are free floating mounted in their bedding, the side-by-side disposition guarantees their longest length for a real sniping capability.

Safety

Trigger safety, made up of a particularly innovative "counter-trigger" since it favours a fast operation with the sole hand holding the weapon, in a fully ambidextrous way.
Ammunitions: easy, simplified and economic storage: limited to the ready for use ammunitions. The suppression of the worn case collecting, treatment and reconditioning procedures is synonymous of substantial savings.
Quadruple weapon safety by introduction of a removable locker for trigger, breech, magazine well and disassembling bolt locking.
Detention control: sytematic shooter habilitation turning the weapon according to the invention into a true answer to the unauthorized use problem.

Operational use

Advantages of the tandem magazine: this disposition of the compartments combined with a three piles organisation of the ammunitions in the magazine makes it possible to carry up to three times the current magazines capacity, that is to say more than a hundred cartridges. This device concentrates the fire power of a machine-gun in an assault rifle, paving the way to a new market of compact and light weapons with superior fire power.
Unequalled discretion by absence of traces (cases) after shooting.
Reinforced effectiveness of the ammunition which benefit from a weight and size reduction up to 50% of that of the traditional ammunition with equal performances.
Increase in the fire power: for the same weight of ammunition, the effective (or projectable) mass is equal to that carried, that is to say 50% more than with classic ammunitions.
Suppression of the classical jamming risk encountered during cased cartridges ejection.
Suppression of burns risks when a case comes into contact with the skin.
The use of two bores paves the way for smart airburst ammunitions. The firepower given to soldier cannot then be compared with that of cased ammunitions weapons.

* * *

The body according to the invention constitutes a base to elaborate a new generation of weapons combining the advantages of the assault rifle, sniper rifle, machine gun and grenade launcher.

This new weapon breed opens a new era in the field of firearms performance that should answer the expectations of numerous police forces, armed forces, headquarters and Special Forces.